W91321-04-C-0023

LOGANEnergy Corp.

Sierra Army Depot PEM Demonstration Project
Midterm Report

Proton Exchange Membrane (PEM) Fuel Cell Demonstration
Of Domestically Produced PEM Fuel Cells in Military Facilities

US Army Corps of Engineers
Engineer Research and Development Center
Construction Engineering Research Laboratory
Broad Agency Announcement CERL-BAA-FY03

Sierra Army Depot Barracks, Building #27
Herlong, CA

June 30, 2005

Executive Summary

Under terms of its FY'03 DOD PEM Demonstration Contract with ERDC/CERL LOGANEnergy has installed a Plug Power GenSys5P 5kWe Combined Heat and Power fuel cell power plant at Sierra Army Depot in Herlong, CA. The site selected for the one-year demonstration project is Barracks Building #27.

This site was previously awarded to another contractor under the CERL BAA FY'01 PEM program. In the original plan, the integration of a SynDex heat pump with the fuel cell to improve upon its thermal utilization characteristics was an important area of investigation. However, as the contractor encountered various mechanical/thermal integration difficulties in the installation, plus the failure of the H-Power fuel cell product to perform adequately, the project was terminated before its conclusion. At that time the site restored to its original condition.

Under this project revival, the unit was electrically configured to provide grid parallel/grid independent service to the site, and it has also been thermally integrated with a SynDex heat pump to provide supplemental heating and cooling to Building #27 during the test period. The methodologies employed to accomplish these tasks are found in the paragraphs that follow. Local electrical and mechanical contractors were hired to provide services as needed to support the installation tasks. It is anticipated that the project will add $2,275 annual energy costs to Sierra Army Depot during the period of performance.

The POC for this project is Larry Duncan whose coordinates are:
lduncan@sierra.army.mil
Tel: 530.827.4343

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Proposal – Proton Exchange Membrane (PEM) Fuel Cell Demonstration of Domestically Produced Residential PEM Fuel Cells in Military Facilities

1.0 Descriptive Title

LOGANEnergy Corp. Small Scale PEM 2004 Demonstration Project at Sierra Army Depot, located in Herlong, CA

2.0 Name, Address and Related Company Information

LOGANEnergy Corporation
1080 Holcomb Bridge Road
BLDG 100- 175
Roswell, GA 30076
(770) 650- 6388

DUNS 01-562-6211
CAGE Code 09QC3
TIN 58-2292769

LOGANEnergy Corporation is a private Fuel Cell Energy Services company founded in 1994. LOGAN specializes in planning, developing, and maintaining fuel cell projects. In addition, the company works closely with manufacturers to implement their product commercialization strategies. Over the past decade, LOGAN has analyzed hundreds of fuel cell applications. The company has acquired technical skills and expertise by designing, installing and operating over 30 commercial and small-scale fuel cell projects totaling over 7 megawatts of power. These services have been provided to the Department of Defense, fuel cell manufacturers, utilities, and other commercial customers. Presently, LOGAN supports 30 PAFC and PEM fuel cell projects at 21 locations in 12 states, and has agreements to install 22 new projects in the US and the UK over the next 18 months.

3.0 Production Capability of the Manufacturer

Plug Power manufactures a line of PEM fuel cell products at its production facility in Latham, NY. The facility produces three lines of PEM products including the 5kW GenSys5C natural gas unit, the GenSys5P LP Gas unit, and the GenCore 5kW standby power system. The current facility has the capability of manufacturing 10,000 units annually. Plug will support this project by providing remote monitoring, telephonic field support, overnight parts supply, and customer support. These services are intended to enhance the reliability and performance of the unit and achieve the highest possible customer satisfaction. Scott Wilshire is the Plug Power point of contact for this project. His phone number is 518.782.7700 ex1338, and his email address is scott_wilshire@plugpower.com.

4.0 Principal Investigator(s)

Name	Samuel Logan, Jr.	Keith Spitznagel
Title	President	Vice President Market Engagement
Company	Logan Energy Corp.	Logan Energy Corp.
Phone	770.650.6388 x 101	860.210.8050
Fax	770.650.7317	770.650.7317
Email	samlogan@loganenergy.com	kspitznagel@loganenergy.com

5.0 Authorized Negotiator(s)

Name	Samuel Logan, Jr.	Keith Spitznagel
Title	President	Vice President Market Engagement
Company	Logan Energy Corp.	Logan Energy Corp.
Phone	770.650.6388 x 101	860.210.8050
Fax	770.650.7317	770.650.7317
Email	samlogan@loganenergy.com	kspitznagel@loganenergy.com

6.0 Past Relevant Performance Information

a) Contract: PC25 Fuel Cell Service and Maintenance Contract #X1237022

Merck & Company
Ms. Stephanie Chapman
Merck & Company
Bldg 53 Northside
Linden Ave. Gate
Linden, NJ 07036
(732) 594-1686

In November 2002 Merck & Company issued a four-year contract to LOGAN to provide fuel cell service, maintenance and operational support for one PC25C fuel cell installed at their Rahway, NJ plant. During the contract period the power plant has operated at 94% availability. LOGAN performs the quarterly and annual service prescribed by the UTC, and performs other maintenance as required. The periods of unavailability are chiefly due to persistent inverter problems that seem to be endemic to the Toshiba power conditioning balance of the system. Field modifications and operating adjustments have largely cured the problem. Quarterly service events take 10 hours to complete with the unit under load, and the annual event takes approximately 35 hours with the unit shut down.

b) Contract: Plug Power Service and Maintenance Agreement to support one 5kWe GenSys 5C and one 5kWe GenSys 5P PEM power plant at NAS Patuxant River, MD.

Plug Power
Mr. Scott Wilshire.
968 Albany Shaker Rd.
Latham, NY 12110
(518) 782-7700 ex 1338

LOGAN performed the start-up of both units after Southern Maryland Electric Cooperative completed most of the installation work. The units are located at residential sites at Patuxant

River Naval Air Station, MD and operate in standard gird connected/grid independent configurations. Both operate at 4.5kWe and have maintained 98% availability. The units, S/Ns 241 and 242 are two of the very latest GenSys models to reach the field. S/N 242 is Plug Power's first LPG fueled system to go into the field. Both have set new performance standards, and raised expectations for near term commercial viability for this product. Operations to date are indicative of the success of the various test and evaluation programs that have been conducted over the past two years.

c) Contract: A Partners LLC; Commercial PC25 Fuel Cell Project Design, Installation and 5-year service and maintenance agreement.

Mr. Ron Allison
A Partners LLC
1171 Fulton Mall
Fresno, CA 93721
(559) 233-3262

On April 20, 2004 LOGAN completed the installation of a 600kWe PC25C CHP fuel cell installation in Fresno, CA. The system operating configurations allow for both grid parallel and grid independent energy service. The grid independent system is integrated with a Multi Unit Load Sharing (MULS) electronics package and static switch, which initial development was funded by ERDC CERL in 1999. This is the third fuel cell installation that uses the MULS System. The thermal recovery package installed in the project includes a 100-ton chiller that captures 210 degree F thermal energy supplied by the three fuel cells to support cooling loads on the first three floors of the host facility. The fuel cells also provide low-grade waste heat at 140 degrees F that furnishes thermal energy to 98 water source heat pumps located throughout the 12-story building during the winter months.

7.0 Host Facility Information

The Sierra Army Depot is located in Herlong, California, in the sparsely populated Lassen County's Honey Lake Valley, which lies nestled in the northeastern foothills of the Sierra Nevada Mountains. Reno, NV (metro population approximately 250,000) is 55 miles southeast of the depot, via Highway 395 South. Susanville, California (metro population approximately 17,500) is 35 miles northwest of the depot, via Highway 395 North.

The mission of the Sierra Army Depot is to provide US Armed Forces with rapid deployment of the best quality equipment and supplies from its base of operations in California to anywhere in the world. Along with these responsibilities, the Sierra Army Depot is also expected to provide maintenance, storage, logistical and training support (to Active, Reserve, and National Guard) for all assets managed which include Operational Project Stocks for Deployable

Medical Systems, Medical Supplies, Petroleum, Water Systems, and Aviation Systems. A map shown below in Figure 1 details the location of the base and its surrounding landscape. The base can be seen situated less than 10 miles from the border of Nevada and California, on the outskirts of Plumas National Forest.

Figure 1 – Overhead Map of Surrounding Areas

8.0 Fuel Cell Installation

The photos below in Figures 2 and 3 are of the east and north elevations, respectively, of Building #27. This building serves as a barracks for personnel stationed at Sierra Army Depot. The Plug Power Gensys5P PEM fuel cell has been installed on a pad that is located in the foreground of the photo of the north elevation. A post-installation photo can be seen in Figure 4. In addition, a 500-gallon LPG tank that provides fuel for the power plant has been situated approximately 25 feet from the unit, as shown in the background of Figure 4. With regard to heat recovery, a SynDex/compressor/heat pump unit has been integrated into the fuel cell CHP configuration, situated a short distance from the GenSys5P in Figure 5.

The LPG unit will operate nominally at a power set-point of 2.5 kWe, consuming .53 gallons of LP Gas per operating hour. At this rate the unit will operate at an electrical efficiency of 20%, based on the propane reforming characteristics of the Lorax 4.5 reformer in this product. In order to boost the overall site economics, optimal thermal recovery practices will figure very importantly in the project. Paragraph 10.0, below, describes in some detail the methodology the project has pursued in order to capture as much waste heat as possible. If the site is able to consistently achieve 58% thermal efficiency, LOGAN estimates the operating cost reduction will be approximately $0.29/kWh. However, given that the cost of LP Gas exceeds $1.10 per Therm, and the unit's electrical efficiency is quite low by most power generating standards, the project must focus on the integration and characterization of untested ancillary systems to show how the product could operate in off-grid applications, where cost accounting is not a significant issue. The Sierra Army Depot POC has been very helpful in obtaining both telephone and high-speed DSL communications for the site.

Figure 2 – Eastern Elevation

Figure 3 – Northern Elevation

As mentioned above, Figure 4, below, shows the GenSys5P situated on the pad site. In the foreground a mounting bracket can be seen which hosts the emergency disconnect switch and electric meter. To the right, several protective posts have been situated in order to alert landscapers and other maintenance personnel of the buried piping and conduit runs. The 500-gallon LPG tank which fuels the power plant can be seen in the background of the photo, approximately 25 feet from the fuel cell.

Figure 4 – Fuel Cell Pad Site and LPG Tank

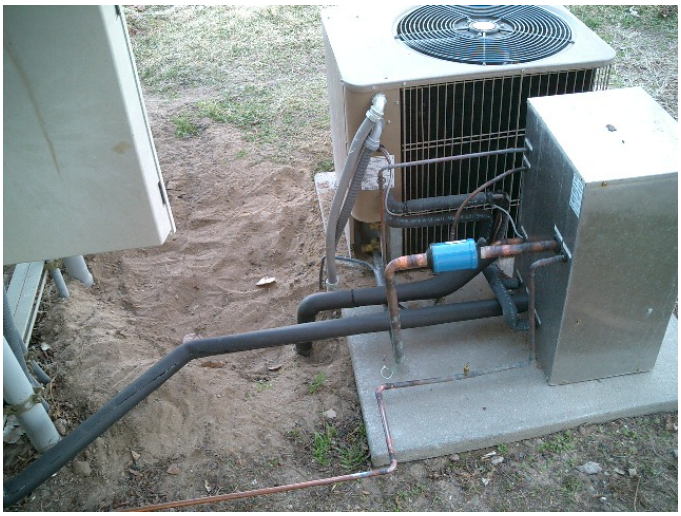

Figure 5 – SynDex Heat Recovery Integration

Figure 5, above, shows a photograph of one of the thermal recovery components being utilized at Sierra Army Depot's PEM demonstration. The SynDex heat pump, located inside the metallic housing adjacent to the A/C unit, facilitates Freon circulation through a heat exchanger which has been integrated into the GenSys5P CHP loop. Further explanation of the thermal recovery operations can be found below, in Paragraph 10.0.

9.0 Electrical System

The Plug Power GenSys 5P PEM fuel cell power plant provides both grid parallel and grid independent operating configurations for site power management. This capability is an important milestone in the development of the Gensys5 system on the pathway to product commercialization. The unit has a power output of 110/120 VAC at 60 Hz, and when necessary the voltage can be adjusted to 208 VAC or 220 VAC, depending upon actual site conditions. The fuel cell has been connected in parallel with the Sierra Army Depot grid feed to the facility via a new 50-amp circuit breaker that LOGAN has installed in the building's existing service panel. In addition, a separate grid-independent emergency panel has been installed to provide service to dedicated loads in the event of a failure of the utility grid feed to the site. This emergency panel and incoming conduit feeds can be seen pictured to the right in Figure 6. While operating at 2.5 kWe, the unit provides nominally 27-30 amps of power to the effected circuits. The SynDex system may be electrically connected to the emergency panel provided its load demands do not exceed the fuel cell's grid independent capacity.

Figure 6 – Mech. Room Electrical Feeds and Emergency Panel

10.0 Thermal Recovery System

Since a SynDex heat pump was available to use with this demonstration project, LOGAN integrated it with a residential air conditioning unit to provide heating and cooling to the barracks building, as shown in Figure 5 above. During the summer months, the air conditioning unit will provide supplemental cooling via the SynDex Freon loop to the fan coils in the building's HVAC system. During the winter months, a hot water heater will serve as a heat sink, not only for domestic hot water, but also to provide supplemental thermal Btus for supporting winter heating loads. To accomplish this, thermal Btus from the fuel cell will be transferred to the water heater through a new heat exchanger being used by LOGAN, the Butler Sun Solutions Solar Wand.

The Butler Sun Solutions Solar Wand, pictured below in Figure 7, was designed to allow standard hot water tanks to make use of solar heating, but is in any case adaptable to any low-grade heat disposal. The Solar Wand is a double-walled heat exchanger that fits into any full size, 40 gallon and up, domestic hot-water tank. The apparatus screws into the outlet port of a standard hot water tank, providing a new hot water outlet and also fluid input/output connections. The Solar Wand itself provides approximately two square feet of heat transfer surface inside the tank. The solar collector fluid, in LOGAN's case a mixture of propylene glycol and water, is isolated from the hot water by two copper walls while the space between is vented outside of the tank.

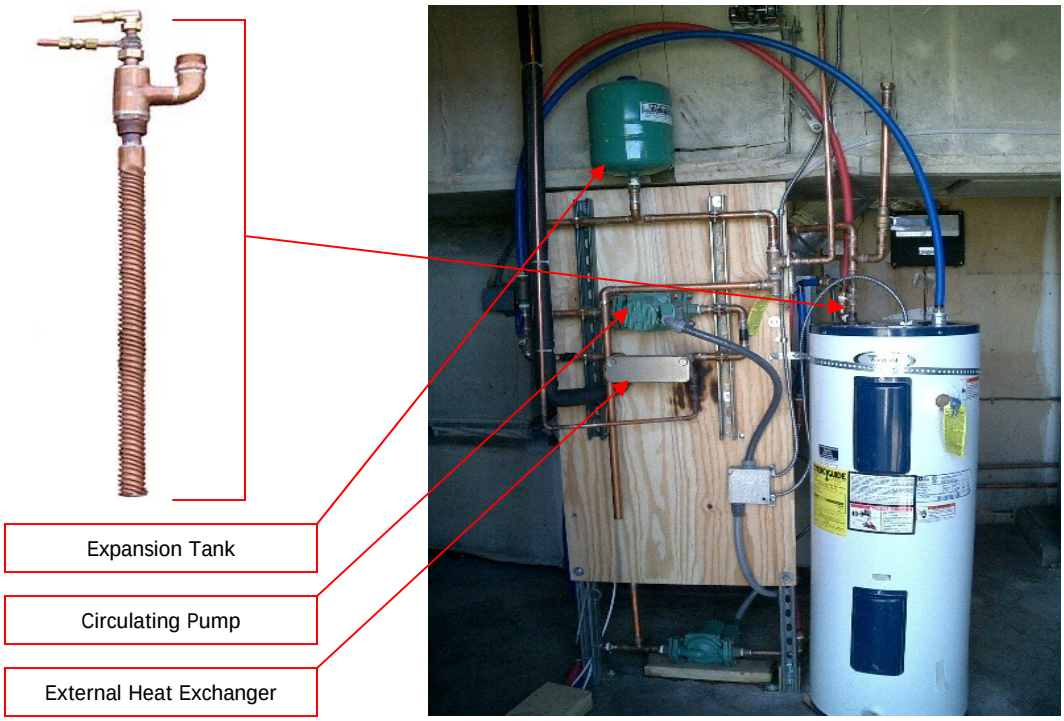

Figure 7 – Solar Wand Heat Recovery Setup

The Solar Wand allows the customer to use the existing hot water tank and a single pump to circulate fluid from the heat source to the Solar Wand. Hot water tanks with built in heat exchangers are not usually available at water heater retail outlets, which makes this component particularly attractive in this application. A photograph of the hot-water heater thermal recovery setup can be seen above in Figure 7.

In addition, a separate external heat exchanger will transfer Btus from the hot-water tank to the SynDex Freon loop, and then to the heat coils located in the HVAC duct within Building #27. The line diagram in Figure 8 illustrates the various methods and means to accomplish these tasks.

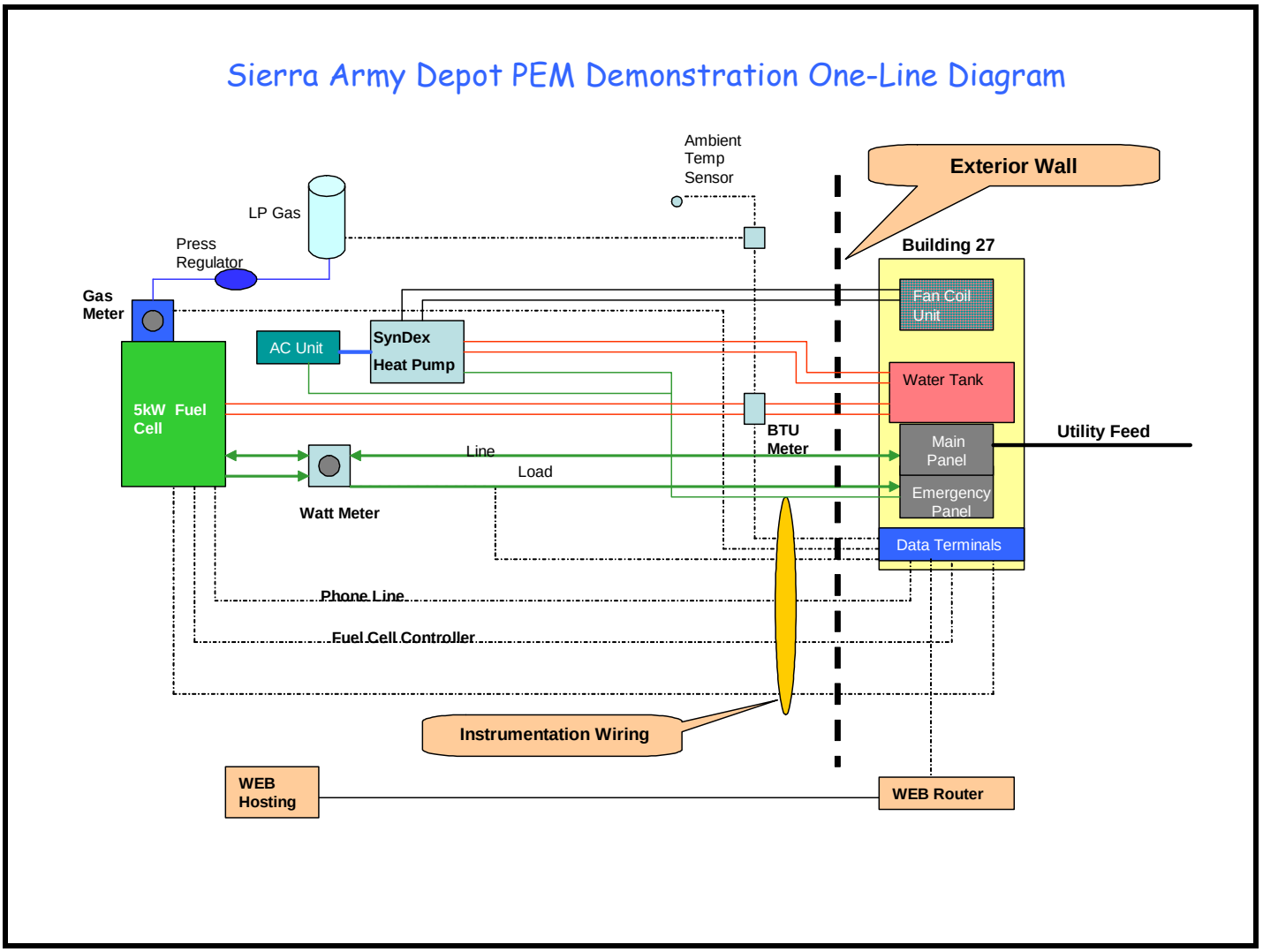

Figure 8 – Sierra Army Depot One-Line Diagram

11.0 Data Acquisition System

LOGAN has installed a Connected Energy Corporation web-based SCADA system that provides high-speed access to real-time monitoring of the power plant. The schematic drawing seen below in Figure 9 describes the architecture of the CEC hardware that will support the project. The system provides a comprehensive data acquisition solution and also incorporates remote control, alarming, notification, and reporting functions. The system picks up and displays a number of fuel cell operating parameters on functional display screens, including kWH, cell stack voltage, and water management, as well as external instrumentation inputs including Btus, fuel flow, and thermal loop temperatures. CEC's Operations Control Center, located in Rochester, New York, maintains connectivity by means of a Virtual Private Network that links the fuel cell to the center.

To view the operation of this unit, log on to https://www.enerview.com/EnerView/login.asp Then login as: logan.user and enter the password: guest. Select the box labeled Sierra Army Depot, or navigate other LOGAN sites using the tool bars or html keys.

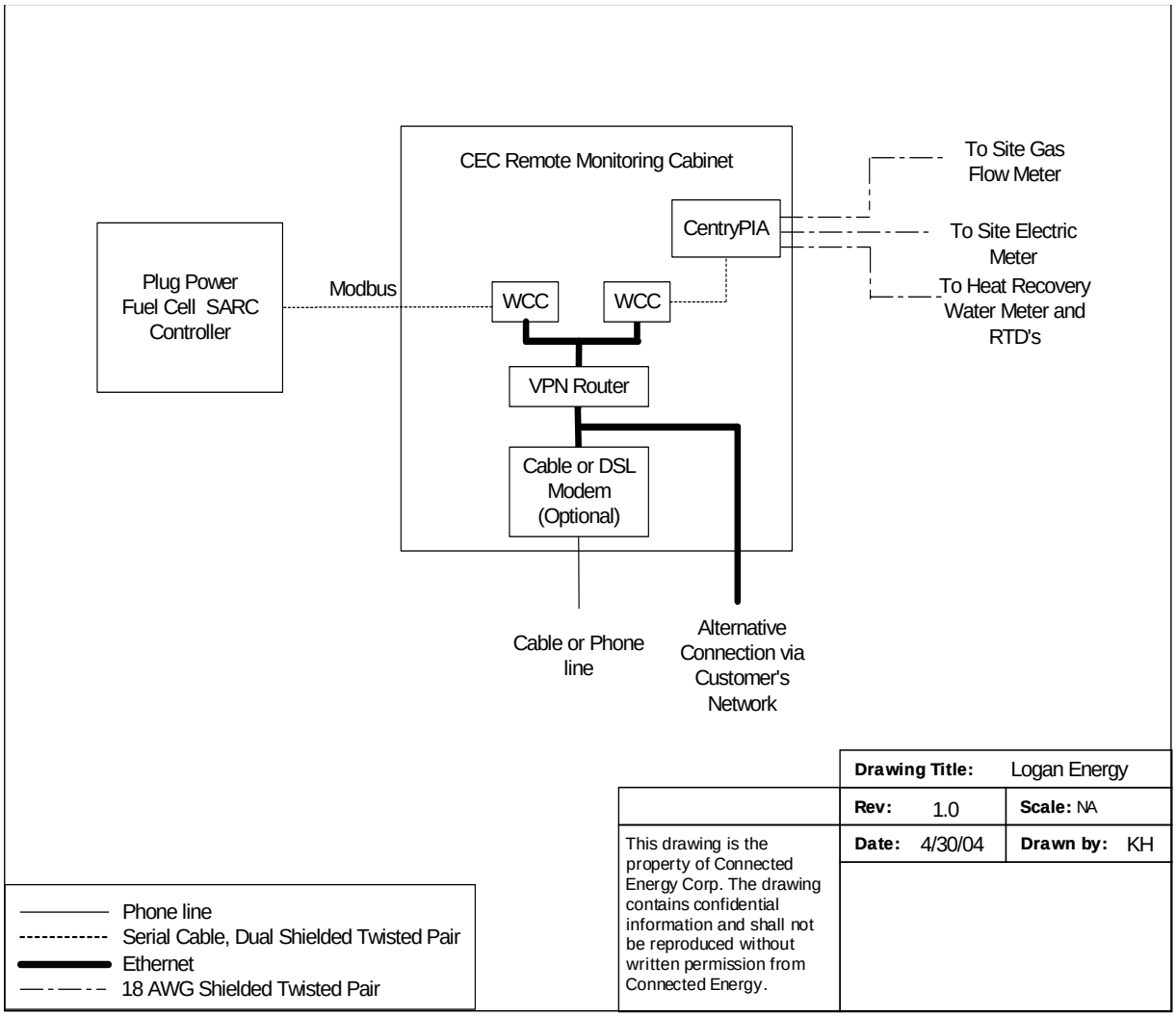

Figure 9 – CEC WEB enabled SCADA Terminal Hardware

LOGAN has procured a high-speed Internet connection to the fuel cell router from a local DSL service provider with the help of Sierra Army Depot POC Larry Duncan. The base has been helpful in providing a local dial tone to a phone jack that is conveniently located in the basement of Building #27 to provide communications with the fuel cell data modem.

12.0 Fuel Supply System

The Plug Power unit provided for this demonstration is an LP Gas fueled system. The fuel supplier installed the 500 gallon fuel storage tank seen in the photo above labeled Figure 4. While operating at a dispatch set-point of 2.5 kWe, the unit consumes .53 gallons per hour. This equates to 20% electrical efficiency, which is low by conventional power generation standards. However, this is a first generation LP Gas fuel cell product, and the more important issue will be to determine that the product functions in accordance with its design specifications and achieves 90% availability during the test period. A regulator at the fuel cell gas inlet maintains the correct fuel cell operating pressure at 14 inches water column.

13.0 Installation Costs

Sierra Army Depot Barracks Building #27				
Project Utility Rates		**Utility**		
1) Water (per 1,000 gallons)	$1.25	Valley Water		
2) Utility (per KWH)	$0.1700	PG&E		
3) LP Gas (per Gal)	$1.25	Camphora Gas		
First Cost			**Estimated**	**Actual**
Plug Power 5 kW GenSys5P			$ 75,000	$ 75,000
Shipping			$ 2,400	$ 2,400
Installation Electrical			$ 7,011	$ 14,820
Installation Mechanical/LP Gas line			$ 22,330	$ 22,507
Installation Thermal			$ 21,197	$ 38,112
Web Communications Package			$ 3,015	$ 11,250
Archaeology/Tribal Observer			$ 8,000	$ 2,909
Site Prep, Labor Materials, Fence			$ 5,550	$ 4,535
Training			$ 3,600	$ 3,600
Installation Travel & Per Diem			$ 5,928	$ 7,248
Technical Supervision/Start-up			$ 9,720	$ 9,720
Total			**$ 163,751**	**$ 192,101**
Assume Five Year Simple Payback			$ 32,750	$ 38,420
Forcast Operating Expenses	Volume	$/Hr	$/ Yr	
LP Gas GPH @ 2.5kW	0.53	$ 0.66	$ 5,223.15	
Water Gallons per Year	14,016		$ 17.52	
Total Annual Operating Cost				$ 5,240.67
Economic Summary				
Forcast Annual kWH		19710		
Annual Cost of Operating Power Plant		$ 0.266	kWH	
Est. Credit Thermal Recovery Rate on kW(t)			kWH	
Project Net Operating Cost		$ 0.144	kWH	
Displaced Utility cost		$ 0.170	kWH	
Energy Savings		$0.026	kWH	
Annual Energy Savings		$521.47		

Explanation of Calculations:

Actual First Cost Total is a *sum* of all the listed first cost components.
Assumed Five Year Simple Payback is the Estimated First Cost Total *divided by* 5 years.

Forecast Operating Expenses:
LP Gas usage in a fuel cell system set at 2.5 kW will consume 0.033 MCF per hour. The cost per hour is 0.033 Mcf per hour *x* the cost of LP Gas to the site per MCF at $6.63. The cost per year at $1716.47 is the cost per hour at $0.22 *x* 8760 hours per year *x* 0.9. The 0.9 is for 90% availability.
LP Gas fuel cell systems set at 2.5 kW will consume 1.6 gallons of water per hour through the DI panel. The total volume of water consumed at 14,016 gallons per year is 1.6 gph *x* 8760 hours per year. The cost per year at $170.01 is 14,016 gph *x* cost of water to the site at $12.13 per 1000 gallons.
The Total Annual Operating Cost, $1886.49 is the *sum of* the cost per year for the LP Gas and the cost per year for the water consumption.

Economic Summary:
The Forecast Annual kWh at 19,710 kWh is the product of the 2.5 kW set-point for the fuel cell system *x* 8760 hours per year *x* 0.9. The 0.9 is for 90% availability.
The Annual Cost of Operating the Power Plant at $0.096 per kWH is the Total Annual Operating Cost at $1886.49 *divided by* the forecast annual kWh at 19,710 kWh.
The Credit Annual Thermal Recovery at -$0.010 is 7800 *divided by* 3414. This is then *multiplied by* 0.9 *x* 0.1*x* the cost of electricity at $0.0500 per kWh *x* (-1). As a credit to the cost summary, the value is expressed as a negative number.
The Project Net Operating Cost is the *sum* of the Annual Cost of Operating the Power Plant *plus* the Credit Annual Thermal Recovery.
The Displaced Utility Cost is the cost of electricity to Sierra Army Depot per kWh.

Energy Savings (cost) equals the Displaced Utility Cost *minus* the Project Net Operating Cost.
Annual Energy Savings (cost) equals the Energy Savings *x* the Forecast Annual kWh.

14.0 Acceptance Test

An 8-hour acceptance test was run on March 15, 2005 by the technician following completion of all the commissioning tasks listed in the Checklist attached below. It was the first successful start-up of the system. Please see Appendix 2 for documentation of the test done by the technician.

Appendix

1) Monthly Performance Data

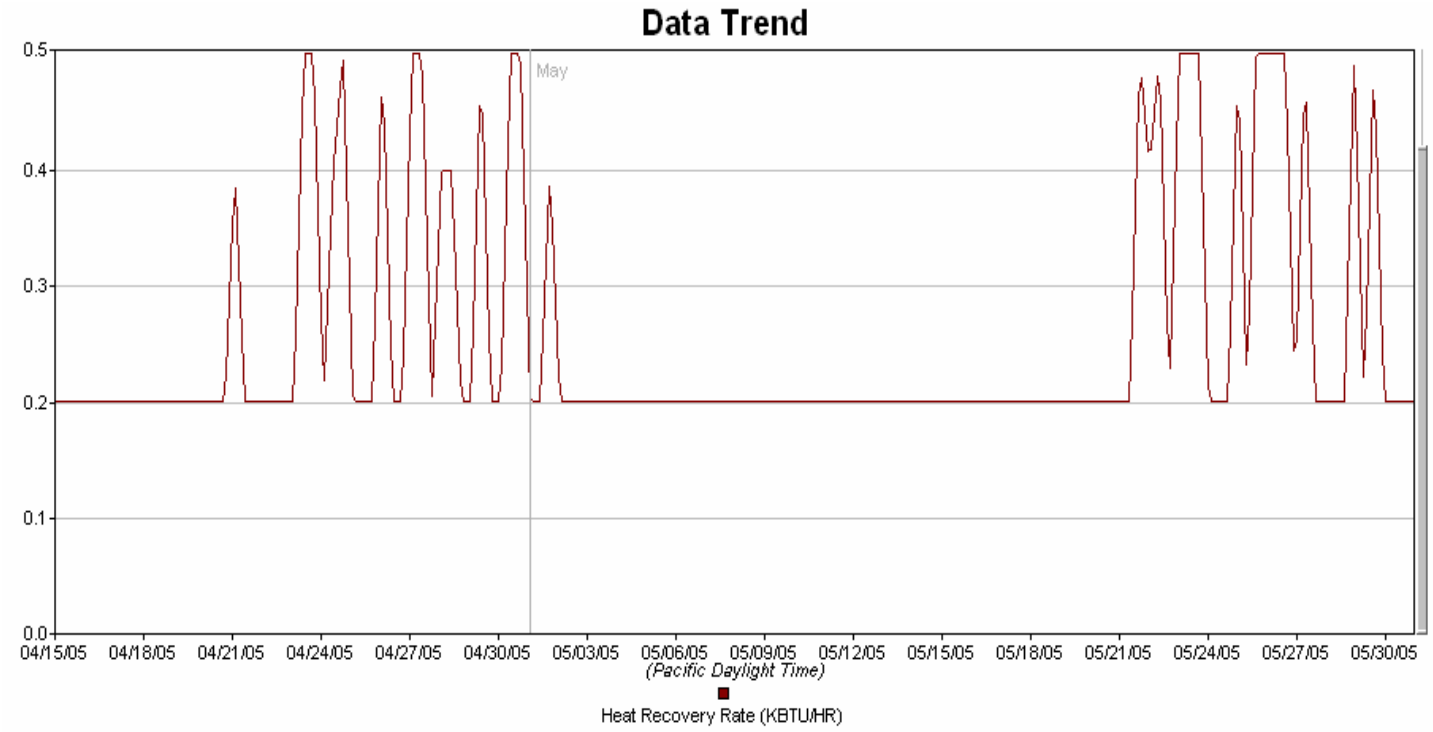

Figure 10 – Heat Recovery Rate in KBtu/hr. from April ’05 through May ‘05

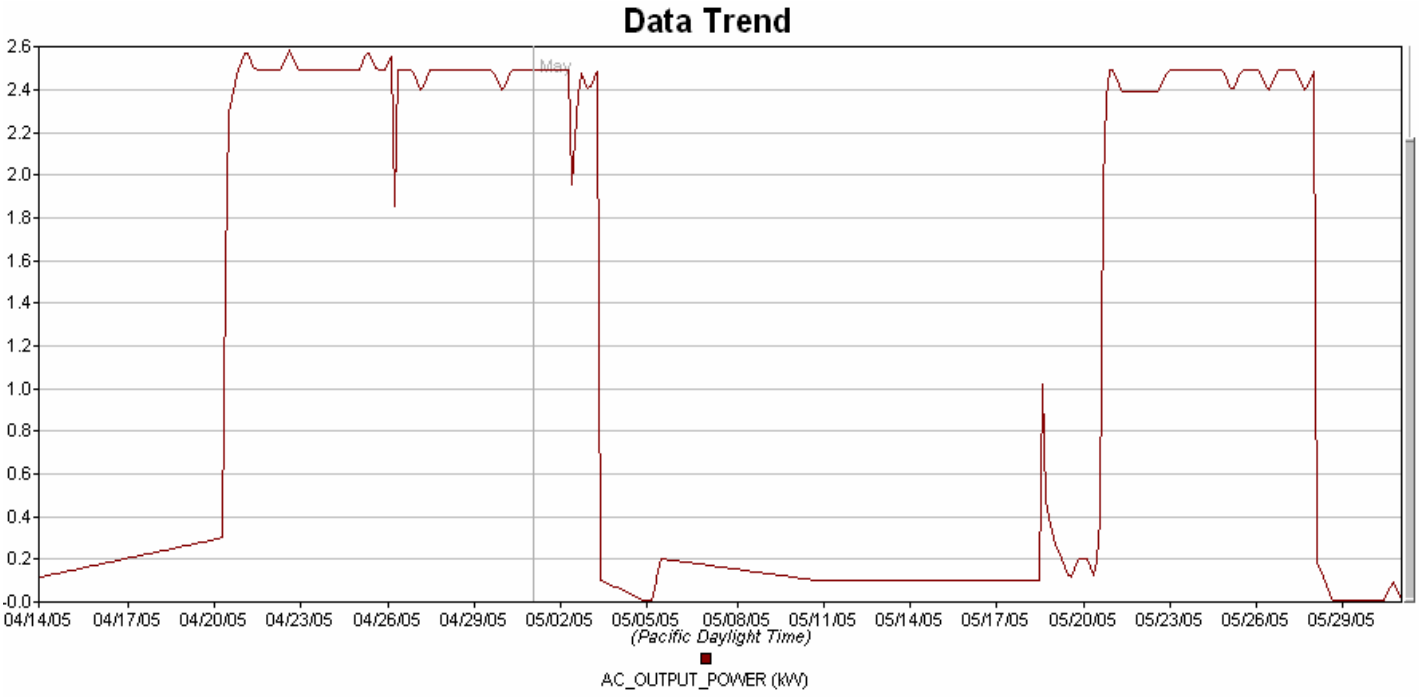

Figure 11 – A/C Output Power in kW from April ’05 through May ‘05

Sierra Army Depot Barracks Building #27

Herlong, California

	Mar-05	Apr-05	May-05	Jun-05	Jul-05	Aug-05	Sep-05	Oct-05	Nov-05
Run Time (Hours)	345	326	242	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)
Time in Period (Hours)	345	720	744	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)
Availability (%)	100%	45%	33%	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)
Energy Produced (kWe-hrs AC)	864.0	746.0	529.0	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)
Output Setting (kW)	2.5	2.5	2.5	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)
Average Output (kW)	2.50	2.29	2.19	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)
Capacity Factor (%)	50.09%	20.72%	14.22%	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)
Fuel Usage, LHV (kWe-hrs AC)	3330.0	3067.0	2078.0	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)
Fuel Usage, LHV (BTUs)	1.14E+07	1.05E+07	7.09E+06	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)
Fuel Usage (SCF)	11232	10345	7009	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)
Electrical Efficiency (%)	25.96%	24.34%	25.47%	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)
Thermal Heat Recovery (BTUs)	0	0	0	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)
Heat Recovery Rate (BTUs/hour)	0	0	0	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)
Thermal Efficiency (%)	0.00%	0.00%	0.00%	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)
Overall Efficiency (%)	25.96%	24.34%	25.47%	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)
Number of Scheduled Outages	0	0	0	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)
Scheduled Outage Hours	0	0	0	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)
Number of Unscheduled Outages	0	1	2	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)
Unscheduled Outage Hours	0	394	502	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)	(N/a)

2) Documentation of Acceptance Test

Installation / Acceptance Test Report

Site: Sierra Army Depot Barracks Building #27
Herlong, California

Installation Check List

TASK	Initials	DATE	TIME (hrs)
Batteries Installed	GC	3/4/05	2
Stack Installed	GC	3/9/05	3
Stack Coolant Installed	GC	3/9/05	1
Air Purged from Stack Coolant	GC	3/9/05	2
Radiator Coolant Installed	GC	3/9/05	3
Air Purged from Radiator Coolant	GC	3/9/05	1
J3 Cable Installed	GC	3/4/05	1
J3 Cable Wiring Tested	GC	3/10/05	0.5
Inverter Power Cable Installed	GC	3/4/05	0.5
Inverter Power Polarity Correct	GC	3/4/05	0.5
RS 232 /Modem Cable Installed	GC	3/4/05	0.5
DI Solenoid Cable Installed with Diode	GC	3/8/05	0.5
Natural Gas Pipe Installed	GC	3/4/05	8
DI Water / Heat Trace Installed	GC	3/8/05	4
Drain Tubing Installed	GC	3/8/05	1

Commissioning Check List and Acceptance Test

TASK	Initials	DATE	TIME (hrs)
Controls Powered Up and Communication OK	GC	3/11/05	4
SARC Name Correct	GC	3/11/05	1
Start-Up Initiated	GC	3/11/05	6
Coolant Leak Checked	GC	3/11/05	1
Flammable Gas Leak Checked	GC	3/11/05	1
Data Logging to Central Computer	GC	3/14/05	2
System Run for 8 Hours with No Failures	GC	3/15/05	8

3) Daily Work Logs
LOGANEnergy Field Technicians
May '04 – May'05

LOGANEnergy Corp.					
Monthly Site Report					
Period	May-04				
Site	Sierra Army Depot				
Engineer	**Date**	**PP S/N**	**Activity**	**Mileage**	**Hours**
G Collard	2004/4/5	311		270	12
			Drove from Yosemite to Truckee Calif. In route to Sierra Army Depot.		
G Collard	2004/5/5	311		450	16
			Drove from Truckee to Sierra Army Depot. Conducted site visit with Larry Duncan. Site is extremely remote, 60 miles to Reno the closest city to purchase material or get any type of assistance if needed. We will have to make some changes to the existing layout but nothing considered exotic. Larry did say that the water is bad there so we might consider placing one of our PC-25 resin bottles in front of the R/O unit along with a larger than normal filter for iron. He said that their water is high in iron. I believe two men one week should be able to complete the installation once we start. Drove back to El Portal to trouble shoot Yosemite in the morning.		

LOGANEnergy Corp.					
Monthly Site Report					
Period	October-04				
Site	Sierra Army Depot				
Engineer	**Date**	**PP S/N**	**Activity**	**Mileage**	**Hours**
G Collard	10/18/2004	311		666	10
			Drive to Sierra Army Depot		
G Collard	10/19/2004	311		60	6
			Kickoff meeting w/Dr Binder & base personnel. Prepare site and place fuel cell w/Sam. Leave for Yosemite.		

LOGANEnergy Corp.					
Monthly Site Report					
Period	Nov-04				
Site	Sierra Army Depot				
Engineer	**Date**	**PP S/N**	**Activity**	**Mileage**	**Hours**
G Collard	11/9/2004	311		744	2
			Attended meeting at the construction office with Larry Duncan, the fire department and security personnel. All is set for start on Dec 6th 2004.		

LOGANEnergy Corp.					
Monthly Site Report					
Period	Feb-05				
Site	Sierra Army Depot				
Engineer	**Date**	**PP S/N**	**Activity**	**Mileage**	**Hours**
G Collard	2/11/2005	311			
			I had a good day here. I got oriented and measurements taken. I disconnected some of the piping from the previous installation to be used on our project. I installed the emergency panel and dug around the SYNDEX to see where pipes were going. I got my dig permit so that I can start the underground tomorrow. The personnel on base don't work on Fridays which would have restricted my access. I told Larry that I can get my underground work started tomorrow and I didn't need access to the building.		
			I do not have a Connected Energy box for this site. I have one for LAAFB that I am going to use and then sort it out when I get back.		
G Collard	2/14/2005	311			7
			Continued installing B311. Installed equipment rack on the end of fuel cell. Installed the rack for the heat recovery equipment. Completed the underground work.		
G Collard	2/25/2005	311			
			I had a pretty good day here today. The cold weather and snow slowed things down a little. The underground is complete. All conduit and piping connections are complete at the fuel cell end. The DI panel and large pre filter are mounted. I will mount the CE panel in the morning.		
			I received a call back from Mark of DMEA regarding my questions on the SYNDEX. I wanted to know if the loop going to the SYNDEX from the heat sync had to be R-22 Freon. He said yes it did. I also wanted to get an idea of what pressure that loop worked at. He said about 70 Psi. The fact that the loop has to filled with R-22 means I have to get an A/C contractor involved because of the license. I had the local plumbing supply recommend three that I will call in the morning. The same contractor will replace the compressor in the Heat pump.		
			All is moving well. Since we have the marketing time next week this site should be done and running the first week of March.		

			Another good day in God's country. I completed the underground and backfilled the trenches. I built the end rack for the fuel cell. I built the rack for the heat recovery equipment and R/O unit. I am going to need a solar wand in this project. I am going to install a 30 gallon water heater as the heat sync and use the heat exchanger that they previously had installed for the interface to the SYNTEX unit		
			No progress photos here. Photo taking is very restricted.		
			I need a mini electrical meter, a Gallus 2000 mini gas meter with Pulse transmitter and a solar wand. I will order the Solar Wand		

LOGANEnergy Corp.					
Monthly Site Report					
Period	March-05				
Site	Sierra Army Depot				
Engineer	**Date**	**PP S/N**	**Activity**	**Mileage**	**Hours**
G Collard	3/1/2005	311			
			We arrived at Herlong this afternoon, dropped off the 30 gal water heater and the proceeded to the hotel. We will be on site first thing in the morning.		
G Collard	3/4/2005	311			
			Good productive day here. The propane tank was delivered today. They are going to fill it tomorrow.		
			The electrical is only missing the main breaker. That breaker is due in tomorrow.		9
			Heat recovery is complete. The loop to the SYNDEX will be done on Tuesday. The A/C contractor could not get the replacement compressor for the heat pump.		9.5
			I should be able to start the fuel cell on Wednesday morning.		
G Collard	3/8/2005	311			
			Continue installing the heat recovery system.		8
G Collard	3/9/2005	311			
			Completed the gas line, I installed the stack, filled the system and went for a start. I got close but no cigar. It got to late to try again.		9
			The air conditioning contractor will not be on sight until Thursday morning. I will get the fuel cell started tomorrow and complete some small items tied to the CE box. I will also work with CE to get the data working hopefully before I leave Friday.		
G Collard	3/10/2005	311			

			I had a pretty good day today all around. I got the fuel cell started after several bouts with shutdowns for Electronic Cabinet Temp High which was bogus. I think I was just being kept humble. I was going to look for wats but figured Mike's pets would not migrate this far.		7
			I am running into a couple of minor problems with the heat recovery system but hope to have those resolved today. The air conditioning guy is suppose to be on site this morning. He said he can complete everything he needs to do in one day, we shall see.		
			I will come back her for a couple of days next week, one make sure everything is functioning correctly and change a pump if necessary and one day for a walk through with the base personnel. I couldn't do it tomorrow (Friday) because nobody works here on Fridays.		
			I did get hung up on the base for two and a half hours (from 17:30 to 20:00) because they had the base locked down for theft. Someone apparently stole a bunch of night vision goggles. They checked every car going out the base. This just happen to coincide with base workers leaving the base. Fortunately I was able to work on the site until 19:45.		
G Collard	3/15/2005	311			
			1110891412,3/15/2005 7:56:52 AM,Reformer Purge (31)EVENT, STARTUP_EVENT, Error Code: (1000)(0)		
			1110891441,3/15/2005 7:57:21 AM,Reformer Purge (31)SHUTDOWN, ELEC_COMP_HIGH_SD, Error Code: (223)(0)		
			1110891441,3/15/2005 7:57:21 AM,SD Ref Cool (104)EVENT, SHUTDOWN_EVENT, Error Code: (1001)(0)		
			1110891560,3/15/2005 7:59:20 AM,ESTOP (107)ESTOP, HW_ESTOP_SARC_L0, Error Code: (534)(0)		
			1110891605,3/15/2005 8:00:05 AM,ESTOP (107)ALERT, ABORT_DATA_TRANSFER, Error Code: (131)(0)		
			1110891807,3/15/2005 8:03:27 AM,Reformer Purge (31)EVENT, STARTUP_EVENT, Error Code: (1000)(0)		
			1110891837,3/15/2005 8:03:57 AM,Reformer Purge (31)SHUTDOWN, ELEC_COMP_HIGH_SD, Error Code: (223)(0)		

			1110891837,3/15/2005 8:03:57 AM,SD Ref Cool (104)EVENT, SHUTDOWN_EVENT, Error Code: (1001)(0)		
			1110891961,3/15/2005 8:06:01 AM,ESTOP (107)ESTOP, HW_ESTOP_SARC_L0, Error Code: (534)(0)		
			1110892653,3/15/2005 8:17:33 AM,Reformer Purge (31)EVENT, STARTUP_EVENT, Error Code: (1000)(0)		
			1110906399,3/15/2005 12:06:39 PM,Running (51)ALERT, H2_STOICH_HIGH, Error Code: (520)(0)		
			1110907339,3/15/2005 12:22:19 PM,Running (51)ALERT, H2_STOICH_HIGH, Error Code: (520)(0)		
			1110908454,3/15/2005 12:40:54 PM,Running (51)ALERT, H2_STOICH_HIGH, Error Code: (520)(0)		
G Collard	3/20/2005	311			
			1111323073,3/20/2005 7:51:13 AM,Running (51)ALERT, GRID_LOSS, Error Code: (632)(0)		
			1111323073,3/20/2005 7:51:13 AM,Running (51)ALERT, SYSTEM_TRANSITIONED_TO_STANDBY, Error Code: (630)(0)		
			1111323083,3/20/2005 7:51:23 AM,Run-GL-SB (53)ALERT, SYSTEM_TRANSITIONED_TO_GRID, Error Code: (631)(0)		
			1111345107,3/20/2005 1:58:27 PM,Run-GL-SB (53)ALERT, FS3_REFORMER_AIR_FLOW_OUT_OF_RANGE, Error Code: (638)(0)		
G Collard	3/25/2005	311			
			1111805529,3/25/2005 9:52:09 PM,Running (51)ALERT, LOW_CELL_TRIP_ALERT, Error Code: (500)(0)		
			1112101502,3/29/2005 8:05:02 AM,Running (51)ALERT, FS3_REFORMER_AIR_FLOW_OUT_OF_RANGE, Error Code: (638)(0)		
G Collard	3/29/2005	311			
			1112128484,3/29/2005 3:34:44 PM,Running (51)ESTOP, HW_ESTOP_TCO_01_PRES7_FG4_L1, Error Code: (628)(0)		
			1112128484,3/29/2005 3:34:44 PM,Running (51)ESTOP, HW_ESTOP_FG1_L5, Error Code: (531)(0)		

			1112128484,3/29/2005 3:34:44 PM,Running (51)ESTOP, HW_ESTOP_FG3_L6, Error Code: (532)(0)		
			1112128496,3/29/2005 3:34:56 PM,Running (51)ALERT, RECOVER_CATHODE_AIR_BLOWER, Error Code: (555)(0)		
			1112128496,3/29/2005 3:34:56 PM,Running (51)SHUTDOWN, LOSS_FUEL_AIR_BLOWER, Error Code: (545)(0)		
			1112128496,3/29/2005 3:34:56 PM,Unknown (100)SHUTDOWN, LOSS_ATO_BLOWER, Error Code: (546)(0)		
			1112128496,3/29/2005 3:34:56 PM,SD Ref Cool (104)EVENT, SHUTDOWN_EVENT, Error Code: (1001)(0)		

LOGANEnergy Corp.					
Monthly Site Report					
Period	April-05				
Site	Sierra Army Depot				
Engineer	**Date**	**PP S/N**	**Activity**	**Mileage**	**Hours**
G Collard	4/12/2005	311			
			1113321162,4/12/2005 11:52:42 AM,Reformer Warmup (32)ALERT, PHONE_LINE1_BAD_MODEM_RESPONSE, Error Code: (120)(0)		
			1113321212,4/12/2005 11:53:32 AM,Reformer Warmup (32)ALERT, PHONE_LINE1_PASSED, Error Code: (115)(0)		
			1113321260,4/12/2005 11:54:20 AM,Reformer Warmup (32)ALERT, PHONE_LINE2_PASSED, Error Code: (123)(0)		
			1113328817,4/12/2005 2:00:17 PM,Running (51)ALERT, FS3_REFORMER_AIR_FLOW_OUT_OF_RANGE, Error Code: (638)(0)		
			1113328823,4/12/2005 2:00:23 PM,Running (51)ALERT, FS3_REFORMER_AIR_FLOW_OUT_OF_RANGE, Error Code: (638)(0)		
			1113328850,4/12/2005 2:00:50 PM,Running (51)ALERT, FS3_REFORMER_AIR_FLOW_OUT_OF_RANGE, Error Code: (638)(0)		
			1113329022,4/12/2005 2:03:42 PM,Running (51)ALERT, FS3_REFORMER_AIR_FLOW_OUT_OF_RANGE, Error Code: (638)(0)		

			1113362244,4/12/2005 11:17:24 PM,Running (51)ALERT, H2_STOICH_HIGH, Error Code: (520)(0)		
G Collard	4/13/2005	311			
			1113364801,4/13/2005 12:00:01 AM,Running (51)ALERT, FS3_REFORMER_AIR_FLOW_OUT_OF_RANGE, Error Code: (638)(0)		
			1113368512,4/13/2005 1:01:52 AM,Running (51)ALERT, H2_STOICH_HIGH, Error Code: (520)(0)		
			1113389109,4/13/2005 6:45:09 AM,Running (51)ALERT, FS3_REFORMER_AIR_FLOW_OUT_OF_RANGE, Error Code: (638)(0)		
			1113393416,4/13/2005 7:56:56 AM,Running (51)ALERT, FS3_REFORMER_AIR_FLOW_OUT_OF_RANGE, Error Code: (638)(0)		
			1113394540,4/13/2005 8:15:40 AM,Running (51)ALERT, H2_STOICH_HIGH, Error Code: (520)(0)		
			1113415758,4/13/2005 2:09:18 PM,Running (51)ESTOP, HW_ESTOP_TCO_01_PRES7_FG4_L1, Error Code: (628)(0)		
			1113415758,4/13/2005 2:09:18 PM,Running (51)ESTOP, HW_ESTOP_FG1_L5, Error Code: (531)(0)		
			1113415758,4/13/2005 2:09:18 PM,Running (51)ESTOP, HW_ESTOP_FG3_L6, Error Code: (532)(0)		
			1113415763,4/13/2005 2:09:23 PM,Running (51)ALERT, RECOVER_CATHODE_AIR_BLOWER, Error Code: (555)(0)		
			1113415763,4/13/2005 2:09:23 PM,Running (51)SHUTDOWN, LOSS_FUEL_AIR_BLOWER, Error Code: (545)(0)		
			1113415763,4/13/2005 2:09:23 PM,Unknown (100)SHUTDOWN, LOSS_ATO_BLOWER, Error Code: (546)(0)		
			1113415763,4/13/2005 2:09:23 PM,SD Ref Cool (104)EVENT, SHUTDOWN_EVENT, Error Code: (1001)(0)		
G Collard	4/14/2005	311			
			1113451203,4/14/2005 12:00:03 AM,Shutdown Complete (105)ESTOP, HW_ESTOP_TCO_01_PRES7_FG4_L1, Error Code: (628)(0)		

			1113451203,4/14/2005 12:00:03 AM,Shutdown Complete (105)ESTOP, HW_ESTOP_FG1_L5, Error Code: (531)(0)		
			1113451203,4/14/2005 12:00:03 AM,Shutdown Complete (105)ESTOP, HW_ESTOP_FG3_L6, Error Code: (532)(0)		
G Collard	4/20/2005	311			
			1114001791,4/20/2005 8:56:31 AM,Manual (20)ALERT, BAT_VOLTAGE_LOW_ALERT, Error Code: (373)(0)		
			1114001939,4/20/2005 8:58:59 AM,Manual (20)ALERT, BAT_VOLTAGE_LOW_ALERT, Error Code: (373)(0)		
			1114002175,4/20/2005 9:02:55 AM,Manual (20)ALERT, PHONE_LINE1_PASSED, Error Code: (115)(0)		
			1114002223,4/20/2005 9:03:43 AM,Manual (20)ALERT, PHONE_LINE2_PASSED, Error Code: (123)(0)		
			1114002265,4/20/2005 9:04:25 AM,Reformer Purge (31)EVENT, STARTUP_EVENT, Error Code: (1000)(0)		
			1114007586,4/20/2005 10:33:06 AM,Reformer Warmup (32)ALERT, PHONE_LINE1_PASSED, Error Code: (115)(0)		
			1114007634,4/20/2005 10:33:54 AM,Reformer Warmup (32)ALERT, PHONE_LINE2_PASSED, Error Code: (123)(0)		
			1114013809,4/20/2005 12:16:49 PM,Running (51)ALERT, PHONE_LINE1_PASSED, Error Code: (115)(0)		
			1114013857,4/20/2005 12:17:37 PM,Running (51)ALERT, PHONE_LINE2_PASSED, Error Code: (123)(0)		
G Collard	4/27/2005	311			
			1114632550,4/27/2005 4:09:10 PM,Running (51)ALERT, FS3_REFORMER_AIR_FLOW_OUT_OF_RANGE, Error Code: (638)(0)		
G Collard	4/29/2005	311			
			1114801007,4/29/2005 2:56:47 PM,Running (51)ALERT, FS3_REFORMER_AIR_FLOW_OUT_OF_RANGE, Error Code: (638)(0)		

LOGANEnergy Corp.					
Monthly Site Report					
Period	May-05				
Site	Sierra Army Depot				

Engineer	Date	PP S/N	Activity	Mileage	Hours
G Collard	5/2/2005	311			
			1115033857,5/2/2005 7:37:37 AM,Running (51)ALERT, FS3_REFORMER_AIR_FLOW_OUT_OF_RANGE, Error Code: (638)(0)		
G Collard	5/5/2005	311			
			1115120686,5/3/2005 7:44:46 AM,Running (51)SHUTDOWN, LEVS5_HUMID_LOW_SD, Error Code: (377)(0)		
			1115120686,5/3/2005 7:44:46 AM,SD Ref Cool (104)EVENT, SHUTDOWN_EVENT, Error Code: (1001)(0)		
			1115120690,5/3/2005 7:44:50 AM,SD Ref Cool (104)ESTOP, HW_ESTOP_TCO_01_PRES7_FG4_L1, Error Code: (628)(0)		
			1115120690,5/3/2005 7:44:50 AM,SD Ref Cool (104)ESTOP, HW_ESTOP_FG1_L5, Error Code: (531)(0)		
			1115120690,5/3/2005 7:44:50 AM,SD Ref Cool (104)ESTOP, HW_ESTOP_FG3_L6, Error Code: (532)(0)		
			1115120701,5/3/2005 7:45:01 AM,SD Ref Cool (104)SHUTDOWN, LOSS_ATO_BLOWER, Error Code: (546)(0)		
			1115120726,5/3/2005 7:45:26 AM,SD Ref Cool (104)ALERT, BAT_VOLTAGE_LOW_ALERT, Error Code: (373)(0)		
G Collard	5/5/2005	311			
			1115253719,5/4/2005 8:41:59 PM,Manual (20)ALERT, BAT_VOLTAGE_LOW_ALERT, Error Code: (373)(0)		
G Collard	5/5/2005	311			
			1115285374,5/5/2005 5:29:34 AM,Manual (20)ALERT, BAT_VOLTAGE_LOW_ALERT, Error Code: (373)(0)		
			1115290180,5/5/2005 6:49:40 AM,Reformer Purge (31)EVENT, STARTUP_EVENT, Error Code: (1000)(0)		
			1115301540,5/5/2005 9:59:00 AM,Unknown (100)ALERT, REMOTE_REQUESTED_SHUTDOWN, Error Code: (600)(0)		
			1115301540,5/5/2005 9:59:00 AM,SD Ref Cool (104)EVENT, SHUTDOWN_EVENT, Error Code: (1001)(0)		
			1115301547,5/5/2005 9:59:07 AM,SD Ref Cool (104)ESTOP, HW_ESTOP_TCO_01_PRES7_FG4_L1, Error Code: (628)(0)		
			1115301550,5/5/2005 9:59:10 AM,SD Ref Cool (104)SHUTDOWN, LOSS_ATO_BLOWER, Error Code: (546)(0)		

			1115301557,5/5/2005 9:59:17 AM,SD Ref Cool (104)ESTOP, HW_ESTOP_TCO_01_PRES7_FG4_L1, Error Code: (628)(0)		
			1115301568,5/5/2005 9:59:28 AM,SD Ref Cool (104)ESTOP, HW_ESTOP_TCO_01_PRES7_FG4_L1, Error Code: (628)(0)		
			1115301578,5/5/2005 9:59:38 AM,SD Ref Cool (104)ESTOP, HW_ESTOP_TCO_01_PRES7_FG4_L1, Error Code: (628)(0)		
			1115301578,5/5/2005 9:59:38 AM,SD Ref Cool (104)ALERT, BAT_VOLTAGE_LOW_ALERT, Error Code: (373)(0)		
			1115301584,5/5/2005 9:59:44 AM,SD Ref Cool (104)ALERT, BAT_VOLTAGE_LOW_ALERT, Error Code: (373)(0)		
			1115301588,5/5/2005 9:59:48 AM,SD Ref Cool (104)ESTOP, HW_ESTOP_TCO_01_PRES7_FG4_L1, Error Code: (628)(0)		
			1115301619,5/5/2005 10:00:19 AM,SD Ref Cool (104)ESTOP, HW_ESTOP_FS7_PRES2_FS9_L3, Error Code: (629)(0)		
			1115301619,5/5/2005 10:00:19 AM,SD Ref Cool (104)ESTOP, HW_ESTOP_FG1_L5, Error Code: (531)(0)		
			1115301619,5/5/2005 10:00:19 AM,SD Ref Cool (104)ESTOP, HW_ESTOP_FG3_L6, Error Code: (532)(0)		
			1115301652,5/5/2005 10:00:52 AM,ESTOP (107)ALERT, BAT_VOLTAGE_LOW_ALERT, Error Code: (373)(0)		
			1115301659,5/5/2005 10:00:59 AM,ESTOP (107)ESTOP, HW_ESTOP_TCO_01_PRES7_FG4_L1, Error Code: (628)(0)		
			1115301659,5/5/2005 10:00:59 AM,ESTOP (107)ESTOP, HW_ESTOP_FS7_PRES2_FS9_L3, Error Code: (629)(0)		
			1115301659,5/5/2005 10:00:59 AM,ESTOP (107)ESTOP, HW_ESTOP_FG1_L5, Error Code: (531)(0)		
			1115301659,5/5/2005 10:00:59 AM,ESTOP (107)ESTOP, HW_ESTOP_FG3_L6, Error Code: (532)(0)		